

**CONFERENCE OF THE EIGHTEEN-NATION COMMITTEE
ON DISARMAMENT**

ENDC/PV.332
21 September 1967
ENGLISH

FINAL VERBATIM RECORD OF THE THREE HUNDRED AND THIRTY-SECOND MEETING

held at the Palais des Nations, Geneva,
on Thursday, 21 September 1967, at 10.30 a.m.

THE UNIVERSITY
OF MICHIGAN

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DOCUMENT
COLLECTION

Chairman:

Mr. J. CASTANEDA

(Mexico)

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PRESENT AT THE TABLE

Brazil:

Mr. A.F. AZEREDO da SILVEIRA

Mr. A. da COSTA GUIMARAES

Mr. S. de QUEIROZ DUARTE

Bulgaria:

Mr. K. CHRISTOV

Mr. B. KONSTANTINOV

Mr. T. DAMIANOV

Burma:

U KYAW MIN

U PE MYINT AUNG

Canada:

Mr. E.L.M. BURNS

Mr. J.R. MORDEN

Mr. A. BERNIER

Czechoslovakia:

Mr. V. VAJNAR

Mr. J. STRUCKA

Ethiopia:

Mr. A. ZELLEKE

Mr. B. ASSFAW

India:

Mr. V.C. TRIVEDI

Mr. N. KRISHNAN

Mr. K.P. JAIN

Italy:

Mr. R. CARACCIOLO

Mr. G.P. TOZZOLI

Mr. E. FRANCO

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Miss E. AGUIRRE

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Alhaji SULE KOLO

Mr. B.O. TONWE

Poland:

Mr. M. BLUSZTAJN
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Mr. O. IONESCO
Mr. A. CORCIANU
Mr. C. MITRAN

Sweden:

Mr. A. EDELSTAM
Mr. R. BOMAN

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Republics:

Mr. A.A. ROSHCHIN
Mr. M.V. ANTYASOV
Mr. V.V. SHUSTOV

United Arab Republic:

Mr. O. SIRRY
Mr. M. SHAKER

United Kingdom:

Mr. I.F. PORTER
Mr. R.I.T. CROMARTIE

United States of America:

Mr. A.S. FISHER
Mr. S. DePALMA
Mr. L. WEILER
Mr. G. BREAM

Special Representative of the
Secretary-General:

Mr. D. PROTITCH

Deputy Special Representative
of the Secretary-General:

Mr. W. EPSTEIN

1. The CHAIRMAN (Mexico) (translation from Spanish): I declare open the 332nd plenary meeting of the Conference of the Eighteen-Nation Committee on Disarmament.
2. Mr. BURNS (Canada): At present the position in the Conference seems to be that the co-Chairmen are awaiting the other members' considered reactions to the draft treaty on non-proliferation which they have presented (ENDC/192, 193). Some of the other countries have given their views, others are waiting, and we are all waiting hopefully for the presentation of article III, which will complete the treaty. The Canadian delegation hopes that it will be possible to act a little more urgently on this problem, which has been characterized as the most urgent in the whole field of disarmament.
3. In the meantime there are other subjects on which we might utilize the interval granted to speak; and today I propose to make a brief statement on the question of the cessation of nuclear weapon tests and to comment on some of the views expressed on that subject in statements by the delegations of Sweden, the United Kingdom and the United States. Much of the discussion was on the scientific aspects of the problem of detecting and identifying underground nuclear explosions. I shall be able to lay before the Committee some of the views of Canadian seismologists and other Canadian scientists who have been working on that problem.
4. I will first quote two paragraphs of resolution 2163 (XXI) of the United Nations General Assembly, as follows:
 - "3. Expresses the hope that States will contribute to an effective international exchange of seismic data;
 - "4. Requests the Conference of the Eighteen-Nation Committee on Disarmament to elaborate without any further delay a treaty banning underground nuclear weapon tests." (ENDC/185)
5. As everyone knows, the Committee has been giving priority attention to the production of a treaty on non-proliferation; and that has precluded a thorough-going discussion and debate on the other disarmament subjects which were recommended by the General Assembly for our urgent attention. Nevertheless, as I have said, there have been some important statements in regard to the problem of verifying that obligations not to conduct underground nuclear tests are being observed.

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6. Furthermore, we have heard many delegations state their view that an extension of the Moscow Treaty (ENDC/100/Rev.1) which would prohibit underground nuclear testing as well as testing in the elements covered by the existing Treaty would be a logical measure to follow an agreement on non-proliferation. We have also heard the representatives of the nuclear Powers in this Committee state that they are in favour of arriving at an agreement to prohibit nuclear testing underground, provided that agreement can be reached on what constitutes adequate verification.

7. Mrs. Myrdal, the representative of Sweden, stated more precisely what was preventing progress on such a measure. She said:

"The obstacle is proclaimed to lie in the issue of control --- or, more precisely, in a lack of agreement among the nuclear-weapon Powers on the verification system needed for monitoring such a treaty. One side is upholding the thesis that on-site inspections are necessary to ensure that no violations occur; while the other side reiterates that national means of detection and verification are satisfactory and that no on-site inspections should be prescribed." (ENDC/PV.309, para.15)

8. We should like to say at this point that Canada is very much in sympathy with the approach to this problem which our Swedish colleagues have been pursuing for some time now; and we have made that clear on many occasions. We agree especially that at the present time progress seems most likely to be achieved through an extension of the scientific study of the problem of detection and identification of underground nuclear explosions. Prospects would be hopeful if all countries with developed seismological science, particularly those represented on this Committee, could carry out research on the problem, sharing the results of their investigations freely in a spirit of open co-operation. Canada has supported the "nuclear detection club" idea, and we hope it will be possible to develop it more actively before long.

9. After the Swedish representative had made the statement concerning obstacles to the conclusion of the agreement to prohibit nuclear testing, she proceeded to give the Swedish views on how the difficulty might be overcome and on the present state of the science and art of detecting and identifying underground nuclear explosions. Her statement was based on the results of scientific investigation and analysis of the problems, carried out in Sweden. As we know, that analysis

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relies to some extent on mathematical methods which for most of us here, including myself, are somewhat esoteric in nature. However, one statement made by the representative of Sweden excited great interest and was later disputed by the representatives of the United States and the United Kingdom. That particular statement was the following:

"... identification methods are indeed so effective that it now seems to have become meaningful to discuss verification without on-site inspection." (ibid., para.22)

10. In a statement at our meeting on 11 July Mr. Foster, representative of the United States, challenged the conclusions which the Swedish experts had drawn from their investigation of the subject and said the following:

"No data that we have or have ever seen presented support anything like the small number of only one earthquake being mistaken for an explosion every fifteen years which was referred to by Mrs. Myrdal. Only by supplementing seismic methods with on-site inspections can we hope to reduce the number of unidentified events to such a level." (ENDC/PV.312, para.16)

11. At our meeting on 20 July (ENDC/PV.315) Mr. Edelstam replied to Mr. Foster and also submitted a document entitled "Memorandum on the control of an underground test ban treaty" (ENDC/191).

12. Then at our meeting on 3 August we had a statement from Mr. Mulley, representative of the United Kingdom, in which he gave the opinions of the United Kingdom scientists who had been working on the problem. His statement included the following words:

"That ... report" ---

the report of the British Atomic Weapons Research Establishment published in November 1965 --

"brings out the fact that the number of earthquakes producing less complex and sharp signals which might be mistaken for underground explosions is highly variable within any year. The conclusion of that report, taking one area as an example, is that between 80 and 85 per cent of earthquakes above magnitude 4 are now identifiable. The number should rise to 90 per cent as techniques improve." (ENDC/PV.319, para.12)

13. Mr. Mulley referred with approval to the Swedish proposals of last year which have become known as "inspection by challenge", and hoped that Sweden was still holding to that approach for the solution of the problem. In a later statement

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Mrs. Myrdal assured the United Kingdom delegation that Sweden was indeed maintaining its "challenge" proposal and gave an outline of how it might be expected to work, in conjunction with Sweden's current assessment of the possibilities of identifying underground nuclear explosions (ENDC/PV.323, paras. 15 et seq.)

14. The views of the United Kingdom authorities on the problem and the Swedish propositions advanced in statements at the 309th and 315th meetings appear to be summed up in the following two sentences in Mr. Mulley's statement:

"It may be that with further technological progress scientific techniques alone may provide the answer, even without on-site inspections. However, I think it will be clear from what I have said today that my Government does not believe that that point has yet been reached." (ENDC/PV.319, para.20)

15. Mr. Foster, the representative of the United States, enounced at our meeting of 8 August further criticism of the Swedish memorandum (ENDC/191) and the scientific paper on which it was based, the report of the National Defence Research Institute of Stockholm entitled Approaches to some test ban control problems. In concluding his statement Mr. Foster said the following:

"Thus I believe that the United States has shown that it takes seriously its responsibilities for attempting to solve the verification problems attendant on the achievement of a comprehensive test ban. Reports such as those recently submitted by the Swedish delegation, and the ensuing technical discussions, contribute substantially to our mutual understanding of the problem. Other work carried out and reported on by our United Kingdom colleagues has also been of crucial importance. If all parties conducting work in this area from whom we have not yet heard discussion of the technical issues were to make available their conclusions, we might reach more rapidly our goal of an adequately-verified comprehensive test-ban treaty."

(ENDC/PV.320, para.62)

In view of that last sentence the Canadian delegation thinks it appropriate to lay before the Committee some comments and observations by the Canadian scientists who have been working on this problem, in the hope that they may contribute to progress.

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16. The Canadian contribution has been to study signal processing from a medium-aperture array, to clarify detection probabilities, to obtain estimates of location accuracy as an aid in screening effectively the very large number of natural earthquakes, and to study identification criteria based initially on teleseismic array observations. A small group is at work in this field, and we are putting any results obtained into the open scientific literature. We believe that other countries should do the same.

17. Canadian scientists welcome the Swedish contribution to this discussion but differ in their interpretation of the effectiveness of the present techniques. Seismic verification of a comprehensive test ban needs adequate consideration of the detection and identification problem as a function of magnitude of explosion yield. Teleseismic methods have been studied in Canada using one well-sited medium-aperture array. Results to date show that, although there is a 90 per cent probability of the detection of an underground explosion equivalent to seismic magnitude 4.5 at distances between 3,000 and 10,000 kilometres from the array, the probability of detection falls to 50 per cent at magnitude 4.0. The two magnitude figures correspond to explosion yields of ten kilotons and one kiloton respectively in hard rock. This rapidly worsening detection capability can become even more of a limitation if decoupling possibilities are considered or if explosions are detonated in unconsolidated material.

18. It is important also to demonstrate that adequate teleseismic coverage of all possible test sites exists. Very simple arguments indicate the need for a number of arrays which is certainly larger than the present number deployed nationally. We would estimate on very simple grounds that one needs at least ten medium-aperture arrays for complete world-wide coverage, possibly supported by a few large-aperture units.

19. Independent Canadian research does not support the Swedish claims for the effectiveness of the teleseismic complexity criteria for the identification of nuclear explosions. Our studies indicate that, if the results from several arrays are available, the United Kingdom estimate of between 5 and 20 per cent of the earthquakes in a large sample showing characteristics usually used to identify explosions is a reliable one. Independently a test has been made on 2000 earthquakes distributed throughout the world, using the results from one array in Canada. Approximately 7 per cent of the earthquakes had some aspects of bomb-like characteristics, using that one criterion.

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20. Obviously a great deal more research is needed in this field, and there is only very limited experience in Canada in the application of other possible criteria. At the moment, however, no method is known to us which can reduce the minimum ambiguity below about 5 per cent, at least for low magnitudes in the 4.5 to 4.0 range.

21. Certain Canadian studies using some of the parameters adopted by Swedish scientists have led to a figure of between five and six inspections per year for a 10 per cent chance of detecting one clandestine explosion only in an area with 200 earthquakes or more per annum occurring. That probability figure improves rapidly with a clandestine series of tests. That estimate uses the best quantitative complexity criterion yet developed by the Canadian scientists for a quick assessment of the results from one array. Undoubtedly progress can be made in reducing that inspection figure, but it seems unlikely to decrease by a factor of ten without a major scientific break-through, which is not yet in sight.

22. The Canadian scientists are concerned at the apparent neglect of the difficulty of accurate location. That is one of the parameters important in establishing an inspection model. We are quite certain that intense international co-operation is essential to locate positions to accuracies of a few tens of kilometres; and we know from Canadian work that approximate locations based on one array are ten times less accurate. This is not an unimportant matter, since the Swedish memorandum assumes that the probability that an on-site inspection of an explosion would prove it to be an explosion is 0.5. That figure must assume a location accuracy about which there can be very reasonable doubt. Those are the views of Canadian scientists.

23. To conclude, the Canadian delegation agrees with Mrs. Myrdal that a mutual understanding of scientific means of monitoring a comprehensive test ban is an essential part of the process leading to such an agreement. As I have mentioned, it is the Canadian position that research in the field of seismic detection and identification must be continued and that the information so obtained should be shared internationally. Indeed, such an interchange of information and ideas could well contribute to the spirit of mutual trust and understanding necessary to facilitate agreement on the political aspects of a comprehensive test ban. With that in mind, Canada will continue to undertake research in this field and to co-operate in sharing the resulting information.

The Conference decided to issue the following communiqué:

"The Conference of the Eighteen-Nation Committee on Disarmament today held its 332nd plenary meeting in the Palais des Nations, Geneva, under the chairmanship of H.E. Ambassador J. Castañeda, representative of Mexico.

"A statement was made by the representative of Canada.

"The next meeting of the Conference will be held on Tuesday, 26 September 1967, at 10.30 a.m."

The meeting rose at 11 a.m.